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Teaching statistics with excel: A hands-on approach for engineering students to promote thinking skills

Abstract

Statistics education has become increasingly important in today's data-driven world, as the ability to analyze and interpret data is critical in many disciplines. However, introductory statistics courses traditionally emphasize rote calculations and procedural knowledge, which can result in passive learning and disengagement from students who may not see the relevance of statistics to their engineering field. To address these challenges, this paper proposes using Excel worksheets as student learning materials in an introductory statistics course to shift from traditional to experiential learning. Excel worksheets provide a hands-on approach to learning that gives students the experience of the actual process of doing statistics. The Excel worksheet facilitates quick and accurate calculations, allows more time for students to interpret statistical results, and encourages active learning. The Excel worksheet allows for real-world data analysis and what-if analyses, making abstract concepts more accessible. In addition, the Excel worksheets are designed to promote 21st-century thinking and collaboration skills, which are increasingly important in today's workforce. This paper presents several examples of Excel worksheet designs for teaching descriptive statistics, developed using the framework of substitution, augmentation, modification, and redefinition (SAMR) model. Excel worksheets promote deep learning and facilitate students' understanding of statistical ideas, concepts, and methods through learning by doing. The paper concludes that Excel worksheets offer a valuable tool for teaching introductory statistics to engineering students, enhancing their thinking skills, and preparing them for the data-driven demands of their field.